

CLAIMS

1. A rubber hose having an outer rubber layer laminated by means of extrusion on the outer peripheral surface of an inner rubber layer, wherein:

5 the inner rubber layer is a fluororubber layer;

the outer rubber layer is a reinforcing yarn-woven silicone rubber layer having reinforcing yarns woven therein;

an intermediate rubber layer having an adhesive component for the adhesion with said fluororubber layer is provided  
10 between said fluororubber layer and said reinforcing yarn-woven silicone rubber layer; and

the intermediate rubber layer is an intermediate silicone rubber layer having a hardness lower than those of said reinforcing yarn-woven silicone rubber layer and said  
15 fluororubber layer.

2. The rubber hose according to claim 1, in which the fluororubber comprises a terpolymer of vinylidene fluoride, hexafluoropropylene and tetrafluoropropylene or a copolymer  
20 of tetrafluoroethylene and propylene.

3. The rubber hose according to claim 1, in which the thickness of the fluororubber layer is set at 0.2 to 1.5 mm.

25 4. The rubber hose according to claim 1, in which the material hardness of the intermediate silicone rubber layer is lower by 10 to 30 in terms of the JIS A hardness than those of the

reinforcing yarn-woven silicone rubber layer and the innermost fluororubber layer.

5. The rubber hose according to claim 1, in which the  
5 thickness of the intermediate silicone rubber layer is set  
at 0.3 to 2 mm.

6. The rubber hose according to claim 1, in which the  
fluororubber layer comprises 5 to 40 parts by weight of aramid  
10 staple fibers in relation to 100 parts by weight of the raw  
material polymer.

7. The rubber hose according to claim 1, in which the  
fluororubber layer comprises 0.5 to 10 parts by weight of a  
15 silicone oil in relation to 100 parts by weight of the raw  
material polymer.

8. The rubber hose according to claim 1, in which the  
intermediate silicone rubber layer comprises 2 to 15 parts  
20 by weight of magnesium oxide in relation to 100 parts by weight  
of the raw material polymer.

9. The rubber hose according to claim 1, in which the  
intermediate silicone rubber layer comprises 1 to 15 parts  
25 by weight of triallyl isocyanurate in relation to 100 parts  
by weight of the raw material polymer.

10. The rubber hose according to claim 1, in which the intermediate silicone rubber layer comprises 0.5 to 10 parts by weight of a silane coupling agent in relation to 100 parts by weight of the raw material polymer.

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11. The rubber hose according to claim 1, in which a silicone release agent is applied onto the inner peripheral surface of the fluororubber layer in the joining portion to a counterpart pipe to be inserted therein.

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12. The rubber hose according to claim 1, in which a plurality of ribs are provided along the circumferential direction in a protruding manner on the inner peripheral surface of the fluororubber layer in the joining portion to a counterpart  
15 pipe to be inserted therein.

13. The rubber hose according to claim 1, in which an organosilane adhesive is applied between the fluororubber layer and the intermediate silicone rubber layer.

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14. A method for manufacturing a rubber hose by means of extrusion in which an intermediate silicone rubber layer is provided between a fluororubber layer and a reinforcing yarn-woven silicone rubber layer outside thereof, the  
25 intermediate layer having a hardness lower than those of the reinforcing yarn-woven silicone rubber layer and the innermost fluororubber layer, wherein:

the fluororubber layer, the intermediate silicone rubber layer containing an adhesive component for the adhesion with said fluororubber layer, the intermediate layer having a hardness lower than those of said fluororubber and said reinforcing yarn-woven silicone rubber outside thereof, and the reinforcing yarn-woven silicone rubber underlayer are extruded in a laminated condition by a first extruder to feed the resulting laminate to a weaving machine;

the weaving machine weaves reinforcing yarns on the outer peripheral surface of the reinforcing yarn-woven silicone rubber underlayer to feed the woven laminate to a second extruder; and

the second extruder coats the outer peripheral surface of the reinforcing woven yarns with a reinforcing yarn-woven silicone rubber upper layer.

15. The method for manufacturing a rubber hose according to claim 14, in which the reinforcing woven yarns and/or the silicone rubber upper layer are formed in multilayer forms.

16. The method for manufacturing a rubber hose according to claim 14, in which a silane coupling agent is applied onto the outer peripheral surface of the fluororubber layer, wherein:

the lamination by the first extruder of the fluororubber layer, the intermediate silicone rubber layer having a hardness lower than those of said fluororubber layer and said

reinforcing yarn-woven silicone rubber layer and the reinforcing yarn-woven silicone rubber underlayer is carried out by:

extrusion of the fluororubber layer by an upstream, first  
5 extruder;

application of the silane coupling agent by a silane coupling agent applicator; and

extrusion of the intermediate silicone rubber layer and the reinforcing yarn-woven silicone rubber underlayer by a  
10 downstream, first extruder.

17. A rubber hose having an outer rubber layer laminated by means of winding on the outer peripheral surface of an inner rubber layer, wherein:

15 the inner rubber layer is a fluororubber layer;

the outer rubber layer is a fabric-reinforced silicone rubber layer;

an intermediate silicone rubber layer containing an adhesive component for the adhesion with the fluororubber layer  
20 is provided between the fluororubber layer and the fabric-reinforced silicone rubber layer; and

the intermediate rubber layer is an intermediate silicone rubber layer having a hardness lower than those of the fabric-reinforced silicone rubber layer and said fluororubber  
25 layer to be the innermost layer.

18. The rubber hose according to claim 17, in which the fluororubber is composed of a terpolymer of vinylidene fluoride, hexafluoropropylene and tetrafluoropropylene or a copolymer of tetrafluoroethylene and propylene.

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19. The rubber hose according to claim 17, in which the thickness of the fluororubber layer is set at 0.2 to 1.5 mm.

20. The rubber hose according to claim 17, in which the material hardness of the intermediate silicone rubber layer is lower by 10 to 30 in terms of the JIS A hardness than those of the reinforcing yarn-woven silicone rubber layer and the fluororubber layer.

15 21. The rubber hose according to claim 17, in which the thickness of the intermediate silicone rubber layer is set at 0.3 to 2 mm.

20 22. The rubber hose according to claim 17, in which the fluororubber layer comprises 5 to 40 parts by weight of aramid staple fibers in relation to 100 parts by weight of the raw material polymer.

25 23. The rubber hose according to claim 17, in which the fluororubber layer comprises 0.5 to 10 parts by weight of a silicone oil in relation to 100 parts by weight of the raw material polymer.

24. The rubber hose according to claim 17, in which the intermediate silicone rubber layer comprises 2 to 15 parts by weight of magnesium oxide in relation to 100 parts by weight  
5 of the raw material polymer.

25. The rubber hose according to claim 17, in which the intermediate silicone rubber layer comprises 1 to 15 parts by weight of triallyl isocyanurate in relation to 100 parts  
10 by weight of the raw material polymer.

26. The rubber hose according to claim 17, in which the intermediate silicone rubber layer comprises 0.5 to 10 parts by weight of a silane coupling agent in relation to 100 parts  
15 by weight of the raw material polymer.

27. The rubber hose according to claim 17, in which a silicone release agent is applied onto the inner peripheral surface of the fluororubber layer in the joining portion to a  
20 counterpart pipe to be inserted therein.

28. The rubber hose according to claim 17, in which a plurality of ribs are provided along the circumferential direction in a protruding manner on the inner peripheral surface of the  
25 fluororubber layer in the joining portion to a counterpart pipe to be inserted therein.

29. The rubber hose according to claim 17, in which an organosilane adhesive is applied between the fluororubber layer and the intermediate silicone rubber layer.

5 30. The rubber hose according to claim 17, in which embossment is formed on the outer peripheral surface of the fluororubber layer.

10 31. The rubber hose according to claim 17, in which a plurality of ribs are provided along the circumferential direction in a protruding manner on the inner peripheral surface of the fluororubber layer in the joining portion to a counterpart pipe to be inserted therein.

15 32. A method for manufacturing a rubber hose by means of winding in which an intermediate silicone rubber layer having a hardness lower than those of the fabric-reinforced silicone rubber layer and the fluororubber layer and containing an adhesive component for the adhesion with said fluororubber  
20 and said fabric-reinforced silicone rubber is provided between the fluororubber layer and the fabric-reinforced silicone rubber layer outside thereof, wherein:

the fluororubber layer sheet is prepared by use of a calender roll;

25 the intermediate silicone rubber is press-coated onto the fluororubber layer sheet to prepare a laminated sheet



composed of the fluororubber layer sheet and the intermediate silicone rubber layer sheet; and

5 a fabric-reinforced silicone rubber topping sheet, prepared in advance, is wound on the laminated sheet to produce the rubber hose.

33. The method for manufacturing a rubber hose according to claim 32, in which an organosilane adhesive is applied onto the outer peripheral surface of the fluororubber layer, wherein;

10 the organosilane adhesive is applied after the fluororubber layer sheet is prepared; and

thereafter the laminated sheet composed of the fluororubber layer sheet and the intermediate silicone rubber layer sheet is prepared by rubbing the intermediate silicone rubber into the fluororubber layer sheet.